

## CONSERVING CHEETAHS ON PRIVATE LAND: USING THE NAMIBIAN CHEETAH *ACINONYX JUBATUS JUBATUS* AS A CASE STUDY

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**Abstract:** Conflict between humans and large carnivores is well documented in Africa, and is one of the chief causes of population declines seen in species such as lions (*Panthera leo*), cheetahs (*Acinonyx jubatus*), and African wild dogs (*Lycaon pictus*). While protected areas provide important refuges for many carnivores, species such as cheetahs cover large areas where protected areas are insufficient to maintain long-term viable populations across much of their range. Over the past century, the world's cheetah population has declined in both numbers and range due to habitat fragmentation, depletion of their natural prey base and the resultant conflict with humans for livestock and farmed game, and indiscriminate killings/removals. Although long-term studies have provided useful information regarding the ecology and biology of the cheetah, the real conservation challenge lies in a better understanding of human behavior and attitudes towards the cheetah and implementing conservation strategies across their range. This paper discusses novel approaches aimed at modifying human behavior including non-lethal predator control and incentives for conservation on private land. We present a long-term study of cheetahs living on Namibian farmland to explore these issues and to share information regarding effective conservation strategies. Although techniques used in Namibia would have to be refined depending on individual circumstances, lessons learned through this study have widespread applications in other places where conservation on private land is critical to the maintenance of viable populations of large carnivores and in those areas most critical for future cheetah conservation.

**Key words:** *Acinonyx jubatus*, carnivores, cheetah, conservation, human-wildlife conflict, Namibia, private land

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### INTRODUCTION

Protected areas, although vital refugia for many endangered species, are increasingly becoming disjunct 'islands' of biodiversity within an inhospitable matrix of human-dominated land (Wilcove et al. 1986, Woodroffe 2001). Lack of space or suitably diverse habitats, a multitude of edge effects, disease impacts, and encroaching pressures from local people make maintaining viable populations of species within these discrete units a difficult task (Ginsberg et al. 1995,

Woodroffe and Ginsberg 1998, Woodroffe 2001). While some species can be satisfactorily managed within the fixed boundaries of such areas, large, wide-ranging carnivores require vast tracts of suitable habitat to maintain viable populations, and protected areas are frequently too small to adequately provide for such species (Woodroffe and Ginsberg 1998, Sillero-Zubiri and Laurenson 2001). Although metapopulation management can assist in conserving large carnivores within

protected areas by using techniques such as translocation or reintroduction (Hunter 1998, Breitenmoser et al. 2001), the matrix surrounding reserves or parks often acts as a sink for dispersing animals, and the levels of mortality sustained outside the reserve can have serious implications in terms of long-term population viability (Rudnai 1979, Ferreras et al. 1992, Woodroffe 2001). Additionally, despite the formal protection of certain areas, the boundaries between 'wildlife' areas and regions of human habitation are becoming increasingly indistinct, with increasing pressure being exerted in many places, from Alaska to sub-Saharan Africa, to utilize wilderness areas for social, economic and political gain (Lindsay 1987, Sillero-Zubiri and Laurenson 2001).

Moreover, urban communities are spreading ever further into previously undeveloped areas, fragmenting habitat patches and creating conflict with resident wildlife (Seidensticker 1986, Clark et al. 2001, Kerley et al. 2002). This existence of humans alongside carnivores, particularly large predators, has always been a difficult situation, and has often been resolved by attempting to eradicate the carnivore (Frank and Woodroffe 2001, Sillero-Zubiri and Laurenson 2001, Woodroffe 2001). The success of this strategy has led to the local extirpation of many predators from areas that were once strongholds for the species, such as brown bears (*Ursus arctos*), lynx (*Lynx lynx*) and wolves (*Canis lupus*) in Britain; wolves, grizzly bears (*Ursus arctos horribilis*) and mountain lions (*Puma concolor*) in parts of the United States; and lions (*Panthera leo*), African wild dogs (*Lycaon pictus*) and spotted hyaenas (*Crocuta crocuta*) across much of Africa (Nowell and Jackson 1996, Woodroffe et al. 1997, Woodroffe 2001).

Within this increasingly complex situation, seeking to segregate humans and

wildlife, while still conserving large, wide-ranging species, it is often considered impractical. For several threatened carnivore species, such as the cheetah, wild dog and the snow leopard (*Uncia uncia*), the majority of remaining populations are now found outside protected areas (Nowell and Jackson, 1996). For successful conservation, as well as effectively maintaining the existing network of protected areas, we need to determine and implement workable strategies outside those areas in order to maintain large, contiguous metapopulations that will be viable in the longer term.

### MANAGING THE MATRIX

Implementing conservation strategies outside protected areas is a complex task, and requires a multi-faceted, interdisciplinary approach (Wayne 1996, Clark et al., 2001). Immediate problems facing conservationists include: 1) habitat loss and degradation; 2) conflict between humans and wildlife; and 3) a lack of incentives for conservation on private land. We use the results of a long-term cheetah conservation program on the Namibian farmlands, conducted by the Cheetah Conservation Fund (CCF), in order to address these issues below. Namibia provides a good environment to explore these topics as there is a relatively high density of large carnivores living on human-dominated land (predominantly farmland, where frequent human-wildlife conflicts arise), the country is poor, the majority of Namibians are heavily dependent upon agriculture (Schneider 1994), and there is a strong need for improved conservation as several of the carnivores, such as cheetahs, African wild dogs and lions, are presently classified as vulnerable or endangered by the IUCN (Hilton-Taylor 2000).

## Habitat Loss And Degradation

Worldwide, the conservation of both carnivores and other species is affected by not only habitat loss and fragmentation, but also by the degradation of remaining habitat (Gilpin and Soule 1986, Nowell and Jackson 1996, Noss et al. 1997), and it is clearly vital to address this issue for successful conservation. Namibia is a vast country of 82.3 million hectares, and cheetahs range through about a third of the country primarily on large commercial livestock and game farmland where there is an abundance of prey (Marker 2002). However, the farmland habitat has undergone severe bush encroachment over the past three decades as a result of livestock overgrazing and fire suppression, and the reduction of large herbivores, which has had impacts in terms of prey density and distribution, reduced productivity of the land, and has had physical impacts on the health of cheetahs (Bester 1996, Bauer 1998, Marker et al. 2003a, Marker 2002). If left unchecked, this process is likely to result in increased scarcity and fragmentation of preferred habitat patches, a reduction in prey biomass, low farmland productivity and a concomitant increase in human-caused mortality as a result of increasing conflict with farmers suffering from economic hardship.

To address this issue, CCF has initiated a project on the Namibian farmlands to harvest encroaching bush in an ecologically sound manner and turn it into compacted fuel logs that can be sold overseas, with profits used to subsidise the sale of fuel logs to local communities. The aims of the scheme include creating local employment, empowering Namibians through capacity building, increasing the influx of foreign currency, increasing land productivity, restoring the natural ecology of the area, and reducing levels of deforestation by providing alternative sources of

firewood. Although this scheme is currently only in its pilot stage, community-based habitat restoration initiatives such as these can play an important role in conservation programs outside protected areas, as it raises awareness of the issues involved and provides tangible community benefits that are directly linked to conservation.

## Human-Carnivore Conflict

Providing physically suitable tracts of land is clearly of little conservation benefit if humans in those areas do not tolerate coexistence with carnivores. Conflict between humans and carnivores usually has several components, including economic losses due to carnivore depredations, ingrained perceptions, fear and misunderstanding regarding carnivore ecology and behaviour, and heavy dependence upon limited resources (Crawshaw and Quigley 1991, Kellert et al. 1996, Clark et al. 2001, Johnson et al. 2001). In Namibia, cheetahs have long been persecuted due to conflict with local farmers, and the population has suffered high levels of offtake as a result, with 6,829 wild cheetahs reported killed or placed in captivity during the 1980s alone (CITES 1992, Marker-Kraus et al. 1996). However, in the past 10 years (1996 – 2005) there has been a decrease in the number of cheetahs reported to the Ministry of Environment and Tourism to have been killed or removed (Table 1) (MET 2005, Stander 2005).

Protecting livestock and farmed game from depredation was the primary reason for cheetah removals reported to CCF in the 1990s, accounting for 91.2% of live cheetah captures ( $n = 343$ ) and 47.6% ( $n = 30$ ) of cheetah killings between 1991 and 1999 (Marker et al. 2003a). Cheetah removals were often performed as a preventative measure, rather than in response to actual depredation events, with 59% of farmers removing cheetahs even

though they did consider them problematic (Marker et al. 2003b). Analysis of scat from wild cheetahs on the farmlands indicated that they preferentially selected native game species over either livestock or exotic game (Marker et al. 2003c), suggesting that they were less of an economic threat to farmers than was commonly perceived. However,

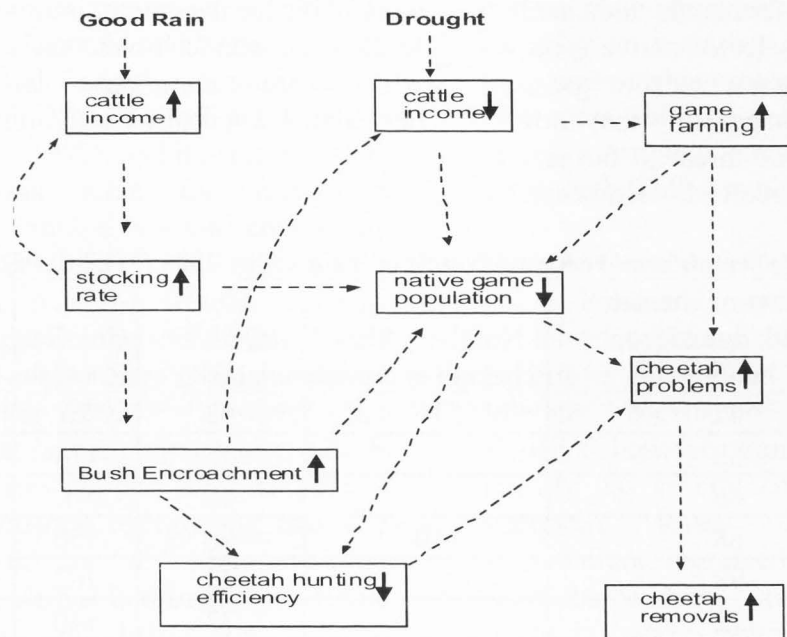
such research is unlikely to change deeply ingrained perceptions, and it is important to work with local communities to reduce the level of economic losses that are sustained, which are commonly attributed to depredation events by carnivores.

**Table 1. Total number of cheetah removed from Namibia from 1996 –2005 (MET 2005).**

Year	Number of cheetah removed due to trophy hunting	Number of live cheetah exported	Total (Quota = 150)	Conflict Cheetah	Total
1997	42	16	58	76	134
1998	58		58	114	172
1999	66		66	91	157
2000	88	10	98	150	248
2001	98		98	202	300
2002	72		72	140	212
2003	86		86	189	275
2004	81		81	125	206
2005	127		127	83	210
<b>Total</b>	<b>718</b>	<b>26</b>	<b>744</b>	<b>1170</b>	<b>1914</b>

In Namibia, human predator conflict is exacerbated by the arid environments, where unpredictable climatic conditions and periodic droughts affect vegetation and productivity yields, and hence economic income. A direct correlation has been shown between economic income versus tolerance and perception behaviour of farmers towards predators (Marker 2002). High economic income as a result of good grassing through productivity yields during good rainfall seasons boosts tolerance and perception towards predators, whereas the opposite may be experienced during drought seasons. Farmers tend to increase their stocking rates to boost cattle income following good rainfall seasons. High stocking rates could increase the risk of overgrazing, thus promoting bush encroachment, affecting suitable cheetah habitat negatively. During drought seasons,

cattle income declines, whereas certain wildlife species may starve due to poor grazing. Livestock in a weaker condition also makes them more vulnerable to predation, thus predator conflict increases. Loss of suitable habitat such as through bush encroachment and decline in cheetah populations thus became a cycle being perpetuated, as farmers adjust their management to counteract further economic loss (Figure 1).



**Figure 1. Conceptual model showing the relationship between the environment and cheetah conflict on commercial farmlands (Marker 2002).**

A baseline survey to determine local attitudes towards large carnivores revealed that although 64% of Namibian farmers surveyed removed cheetahs from their land, usually to prevent depredation, and more than 60% used no form of livestock management (Marker et al. 2003b). Failure to use these basic techniques, such as calving camps to protect vulnerable animals, synchronizing calving seasons, using herders and/or guarding animals, bringing in all smallstock at night, keeping adequate stock records and ensuring good veterinary care, is likely to result in livestock losses that are usually blamed on predators, although other factors such as theft, stillbirths, and accidental deaths are likely to play significant roles (Rabinowitz 1986, Quigley and Crawshaw 1992, Marker-Kraus et al. 1996, Schumann 2003).

Encouraging farmers to utilize more effective livestock management techniques can have significant impacts in terms of

reducing losses. In Namibia, we found that using guarding animals was very successful. CCF reported that 76% of farmers who received an Anatolian Shepherd livestock guarding dog reported large declines in the level of livestock loss suffered as the dogs effectively guarded smallstock herds against both predators and theft, and also alerted herders to stock that had been left in the bush (Marker et al. 2005). Livestock guarding dogs were placed primarily with smallstock, while female donkeys with foals, kept amongst cattle, were found to effectively guard herds of cattle from predators (Marker-Kraus et al. 1996). Reducing levels of livestock loss in this way lessens the economic pressures on farmers, and reduces the incentives for removing predators from private land (Marker-Kraus et al. 1996, Schumann 2003).

Predation upon livestock is often aberrant behaviour for carnivores (Rabinowitz 1986) and the majority of

cheetahs that were found killing livestock during our study had physical problems that were likely to hamper their hunting efficiency (Marker et al. 2003a). However, predation upon game is a more difficult issue, as it involves normal hunting behaviour, and conserving large carnivores involves maintaining a suitable prey-base that they can exploit without creating intense conflict. Farmers should be encouraged not to stock exotic game species, as they are expensive, ill-adapted to cope with local conditions and suffer heavily from depredation (Marker-Kraus et al. 1996, Marker and Schumann 1998). The commercial farmlands in Namibia support good populations of free-ranging, native ungulates, and through the formation of conservancies, where multiple farms are managed co-operatively on a sustainable basis, the entire conservancy can sustain populations of some large carnivores, as the resultant depredation does not severely affect individual farmers but is absorbed across the conservancy as a whole.

Education regarding predator ecology, behavior, population status, the role of large carnivores, and more efficient game and livestock management techniques are all key components of any program aimed at resolving conflict with local people. Misconceptions abound in these areas, with uncertainty regarding species identification, ecology, behaviour, how to determine the cause of stock losses, and the level of threat posed by wild carnivores. To address these issues in Namibia, a comprehensive education program has been one of the central tenets of CCF's operation since its inception, with the aim of making the research results available and relevant to the local communities. Between 1991 and 2006, CCF's education staff has worked with over 200,000 students, encouraging an awareness of ecology and conservation issues, and have developed a wide range of

educational materials for teachers to use in local schools. Many learners, from primary schoolchildren to university students, have also visited the field research center, where they are taught about all aspects of cheetah biology, ecology and research projects being conducted, both locally and internationally. Additional courses and training schemes, such as workshops on livestock management, environmental education, and ecology have been implemented with the aim of local capacity-building and empowerment, and internships are provided to assist students in developing marketable skills and completing degrees. Working with local people in a variety of ways, supporting local development, highlighting the potential value of predators on private land and furthering the understanding of ecosystem management are all fundamental to changing negative attitudes towards wildlife, and ultimately reducing the level of conflict (Marker 2002).

#### **Lack Of Incentives For Conservation**

For successful, long-term conservation, however, it is not enough simply to reduce the economic costs of tolerating carnivores on private land, but it is important to actually make their conservation financially beneficial. Diversifying land-use practices away from a singular dependence upon pastoralism can have positive consequences in terms of conservation, by reducing direct conflict with carnivores living on the land and providing alternative sources of income (McCarthy and Allen 1999, Johnson et al. 2001, Marker 2002). Tourism is one way of generating additional revenue, and the presence of large carnivores in an area is a significant draw for tourists (Sillero-Zubiri and Laurenson 2001). Bringing visitors into an area for photographic tours can generate considerable quantities of foreign revenue, and is also less affected than agriculture by

the drought cycles in southern Africa (Lambrechts 1995, Michler 2002). In Namibia, farms at the centre of the Waterberg Conservancy, CCF's core research area, have benefited from increased tourism as a result of people visiting the region to learn more about cheetah ecology and research, providing additional income and increasing tolerance for cheetahs on the farmlands (Marker-Kraus et al. 1996, Marker et al. 2003b). In addition, Otjiwarongo, the nearest town to CCF and the Waterberg Conservancy now markets itself as the "Cheetah Capitol of the World", showing an awareness towards the value of this species and the acceptance of the communities responsibilities towards its long-term survival.

However, large carnivores are often elusive and hard to observe, particularly outside protected areas, so the chances of tourists actually viewing predators directly may be limited in many places, including much of Namibia (Sillero-Zubiri and Laurenson 2001). Despite this, we have found that showing visitors even indirect signs of carnivore presence can be a significant attraction: in Namibia, the occurrence of 'playtrees' (specific trees used by cheetahs for scent-marking [Marker-Kraus & Kraus 1995] ) on farms provides an ecotourism opportunity for visitors, as they often show signs of cheetahs, which increases the awareness both of the presence and ecology of this rare species. Encouraging such ecological awareness amongst tourists is an important component of predator conservation, both in Namibia and in other countries such as Kenya, where the tourist pressure on cheetahs and other carnivores is very intense (Burney 1980, Wykstra-Ross and Marker 2001).

Tourism, however, can be a fickle industry, and even isolated incidents of unrest or violence in a country can have substantial impacts on the numbers of

tourists willing to visit an area, which can be devastating for local communities reliant upon tourists for their income (Infield and Adams 1999, Sillero-Zubiri and Laurenson 2001). For long-term success, several methods of generating revenue from wildlife should be combined to provide communities with a stable income, for instance by offering opportunities for both ecotourism-based safaris and trophy hunting.

Trophy hunting can play an important role in the conservation of large carnivores outside protected areas, with the intention that by giving predators enough potential monetary value, people are deterred from removing them indiscriminately (Child 1996, Sillero-Zubiri and Laurenson 2001). Revenue from trophy hunting can be substantial for local people, as hunters tend to spend more time and money in an area than other tourists (Edwards and Allen 1992, Sillero-Zubiri and Laurenson 2001). Namibia currently has a CITES export quota for 150 cheetahs (CITES 1992) , although the numbers of cheetahs reportedly killed for trophies has never reached the quota limit (Table 1; [Marker and Schumann 1998, MET 2005] ). Trophy hunting accounted for only 11% of the wild cheetah deaths reported to CCF (Marker et al. 2003a), and at its current level seems unlikely to have any significant effect on population viability, however killing cheetah as problem animals continues (Table 1).

However, almost a third of the trophy-hunted cheetahs reported to us were females, and if the same ratio occurs nationwide, such removals could be of greater concern (Marker et al. 2003a). While efforts have been made with certain species to teach hunters how to distinguish between the sexes, with the aim of targeting males (Smith 1995), the similarity between the sexes, limited visibility in densely bushed habitat and the rarity of encountering

a cheetah on a hunt make this approach unlikely to succeed on the Namibian farmlands. Moreover, the potential revenues from trophy hunting presently seem to have little effect in terms of reducing indiscriminate removals (Figure 1), which still dwarf the number of cheetahs killed for trophies (Marker et al. 2003a). This is due to several factors, including the difficulty of finding a cheetah out on the farmlands without resorting to unethical, 'canned' hunts, and the relatively low trophy fee currently charged for cheetahs, which in 2000 was only US \$2000 (MET 1999). Raising the trophy fee substantially would make investing in trophy hunting far more beneficial for the landowners involved. Ideally, trophy hunting permits should be awarded to an entire conservancy, rather than to individual farmers, creating incentives for conservation across a large area.

Market-place pressures can also have strong impacts in terms of driving conservation and raising public awareness of issues, as was seen with the highly successful marketing of 'dolphin-friendly' tuna, and such initiatives can also be utilized for carnivore conservation. Despite the reduction in cheetah removals by Namibian farmers over the years and an increased tolerance towards them (Marker et al. 2003b), this trend could easily be reversed if economic conditions worsened in Namibia, as farmers would be less likely to tolerate any losses due to carnivores (Marker 2002). To avert this situation, economic incentives should be provided to farmers who practice ecologically sound livestock management, such as avoiding lethal predator control, joining conservancies, limiting stocking rates and restoring habitat. With this aim, CCF is currently collaborating with the Namibian meat production company, MeatCo, and the Conservancy Association of Namibia to investigate the viability of

selling beef at a premium from farmers who use 'predator-friendly' techniques, providing direct economic incentives for farmers, and raising international public awareness.

As tourism is increasingly important in southern Africa, another beneficial development is the new certification in South Africa of 'cheetah-friendly' guest farms, which do not remove predators from their land, and this too could provide tangible benefits to conserving carnivores on private land. These initiatives ensure that landowners benefit directly from tolerating predators, circumventing the common problem of conservation revenues failing to reach local people (Martin 1986, Hackel 1999).

## CONCLUSIONS

Protected areas provide important refuges for numerous species, but the successful conservation of many large carnivores depends on conserving them beyond the boundaries of such areas as well. The most critical component of successful conservation outside protected areas involves working with local communities to achieve sustainable human-wildlife coexistence, particularly when the species under consideration are large carnivores (Phillips et al. 1995, Weber and Rabinowitz 1996, Sillero-Zubiri and Laurenson 2001). Conservation initiatives on private land must combine a myriad of interrelated, community-based approaches, including habitat and prey-base conservation or restoration, education about predators, conflict resolution, and financial incentives. Educating local people about predators is critical to conservation, as there is often a lack of awareness that locally abundant species may be globally threatened, and local concerns must be recognized and addressed for any significant progress to be made (Sillero-Zubiri and Laurenson 2001).



Employing this approach on the Namibian farmlands has proved successful in terms of lessening conflict and reducing removals, with farmers showing increased tolerance of cheetahs and annual removal rates falling significantly (Marker et al. 2003b). Conflicts still occur on the farmlands, and removals still take place, but this example shows that attitudes towards predators can be positively influenced by long-term conservation efforts. Highlighting the value of such work on private land does not diminish the importance of protected areas, but rather emphasises the potential of employing approaches that transcend such boundaries for the effective conservation of large carnivores. Overall, through collaborative research and multi-disciplined approaches, both within and outside protected areas, it should be possible to maintain large tracts of habitat where large carnivores can be not only tolerated, but also provide tangible benefits to local people. Achieving this goal will be the most critical step in attaining the long-term conservation of viable predator populations, not for just cheetahs in Namibia, but for many populations of large carnivores across the globe.

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